

AMENDMENTS TO THE CLAIMS

1. (Previously presented) A solid-state image pickup device characterized by comprising:

an imaging area including multiple two-dimensionally arranged pixels,

wherein the pixel has a collective lens and a photoelectric converting portion;

the photoelectric converting portion has a surface in an asymmetrical form;

the collective lens is positioned above the photoelectric converting portion and at a substantial symmetrical center making up for the surface asymmetry in a pixel in a center part of the imaging area;

the collective lens is placed at a position shifted more toward the center of the imaging area from a part on the symmetrical substantial center as a distance from the center of the imaging area to a pixel thereof increases; and

the collective lens has an amount of shift depending on the degree of asymmetry of the surface of the photoelectric converting portion in a pixel positioned at an equal distance from the center of the imaging area.

2. (Previously presented) The solid-state image pickup device according to Claim 1, characterized in that the surface of the photoelectric converting portion has a rectangular form missing at least one corner; and

the collective lens is positioned at a substantial center of the rectangular form in a pixel in the center part of the imaging area.

3. (Previously presented) A solid-state image pickup device characterized by comprising:

an imaging area including multiple two-dimensionally arranged pixels,

wherein each pixel has a collective lens and a photoelectric converting portion;

the collective lens is placed at a position shifted more toward the center of the imaging area as a distance from the center of the imaging area to a pixel thereof increases; and

an amount of the shift of the collective lens is defined based on the height from a surface of the photoelectric converting portion of the collective lens and the thickness in the direction of depth of the substrate of the photoelectric converting portion such that an amount of light incident within the photoelectric converting portion can increase.

4. (Previously presented) The solid-state image pickup device according to Claim 3, characterized in that:

the photoelectric converting portion is inclined to a predetermined side within a pixel, and the collective lens has an amount of shift depending on the amount of an inclination of the position of the photoelectric converting portion within each of pixels having an equal distance from the center of the imaging area.

5. (Previously presented) The solid-state image pickup device according to Claim 3, characterized in that each pixel further has multiple wires provided through an insulating film, and the wires are placed at a position shifted toward the center of the imaging area like the collective lens.

6. (Previously presented) The solid-state image pickup device according to Claim 3, characterized in that a bottom of the photoelectric converting portion is placed at a position shifted from the center of the imaging area toward the outside with respect to the surface thereof.

7. (Previously presented) The solid-state image pickup device according to Claim 6, characterized in that an amount of the shift of the bottom of the photoelectric converting portion is increased as the distance from the center of the imaging area to a pixel thereof increases.

8. (Previously presented) The solid-state image pickup device according to Claim 3, characterized in that the photoelectric converting portion includes an impurity region formed by performing ion-implantation into a semiconductor layer multiple times.

9. (Previously presented) A solid-state image pickup device, characterized by comprising:

an imaging area including multiple two-dimensionally arranged pixels,

wherein each pixel has a photoelectric converting portion, and

a bottom of the photoelectric converting portion is placed at a position shifted from the center of the imaging area toward the outside with respect to the surface thereof in each of at least some pixels of the multiple pixels.

10. (Previously presented) The solid-state image pickup device according to Claim 9, characterized in that an amount of the shift of the bottom of the photoelectric converting portion is increased as the distance from the center part of the imaging area to a pixel thereof increases.

11. (Previously presented) The solid-state image pickup device according to Claim 9, characterized in that the photoelectric converting portion includes an impurity region formed by performing ion-implantation into a semiconductor layer multiple times.

12. (Previously presented) The solid-state image pickup device according to Claim 11, characterized in that the impurity region is formed by performing ion implantation multiple times at different angles of implantation.

13. (Original) An electronic apparatus having a solid-state image pickup device, the apparatus characterized in that:

the solid-state image pickup device has:

an imaging area including multiple two-dimensionally arranged pixels;

the pixel has a collective lens and a photoelectric converting portion;

the collective lens is placed at a position shifted more toward the center of the imaging area as a distance from the center of the imaging area to a pixel thereof increases;

an amount of the shift of the collective lens is defined based on the height from a surface of the photoelectric converting portion of the collective lens and the thickness in the direction of depth of the substrate of the photoelectric converting portion; and

a bottom of the photoelectric converting portion is shifted from the center of the imaging area toward the outside with respect to the surface thereof.

14. (Original) A method of manufacturing a solid-state image pickup device, characterized by comprising:

a step of forming a photoelectric converting portion and collective lens in each pixel of an imaging area,

wherein the collective lens is placed at a position shifted more toward the center part of the imaging area as a distance from the center of the imaging area to a pixel thereof increases; and

an amount of the shift of the collective lens is defined based on the height from a surface of the photoelectric converting portion of the collective lens and the thickness in the direction of depth of the substrate of the photoelectric converting portion such that an amount of light incident within the photoelectric converting portion can increase.

15. (Previously presented) The method of manufacturing a solid-state image pickup device according to Claim 14, characterized in that a bottom of the photoelectric converting portion is placed at a position shifted from the center part of the imaging area toward the outside with respect to the surface thereof.

16. (Previously presented) The method of manufacturing a solid-state image pickup device according to Claim 15, characterized in that an amount of the shift of the bottom of the photoelectric converting portion is increased as the distance from the center of the imaging area to a pixel thereof increases.

17. (Previously presented) The method of manufacturing a solid-state image pickup device according to Claim 16, characterized in that the photoelectric converting portion is formed by performing ion-implantation into a semiconductor layer multiple times.

18. (Previously presented) The method of manufacturing a solid-state image pickup device according to Claim 17, characterized in that the ion-implantation is performed multiple times at different angles of implantation.

Please add the following new claims.

19. (New) A solid-state image pickup device comprising:

pixels arranged in an imaging area, each of the pixels having a collective lens and a photoelectric converting portion,

wherein a configuration for one of the pixels differs from another of the pixels.

20. (New) The solid-state image pickup device according to Claim 19, wherein, as said configuration, the collective lens for said one of the pixels is shifted more toward a center of said imaging area than the collective lens for said another of the pixels.

21. (New) The solid-state image pickup device according to Claim 19, wherein, as said configuration, the collective lens for said one of the pixels is closer to the photoelectric converting portion than the photoelectric converting portion for said another of the pixels.

22. (New) The solid-state image pickup device according to Claim 19, wherein, as said configuration, the photoelectric converting portion for said one of the pixels tilts more from a center part of said imaging area to an outside in a pixel in the screen peripheral part than the photoelectric converting portion for said another of the pixels.

23. (New) The solid-state image pickup device according to Claim 19, wherein, as said configuration, a depth of the photoelectric converting portion for said one of the pixels is greater than a depth of the photoelectric converting portion for said another of the pixels.

24. (New) The solid-state image pickup device according to Claim 19, wherein, as said configuration, wires for said one of the pixels are shifted more toward a center of the imaging area wires for said another of the pixels.

25. (New) The solid-state image pickup device according to Claim 19, wherein the photoelectric converting portion includes multiple impurity regions.